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AUTHOR	Thompson, Russ; Fuller, Albert
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ABSTRACT

This teacher guide is part of the materials prepared for an individualized program for ninth-grade algebra and basic mathematics students. Materials written for the program are to be used with audiovisual lessons recorded on tape cassettes. For an evaluation of the program, see ED 086 545. In this guide, the teacher is provided with objectives for each topic area and guided to materials written for a given topic. Three short criterion tests are included for each topic covered. The work in this package covers addition and subtraction of simple and mixed fractions, multiplication and division of mixed fractions and work on determining the relative size of two fractions. This work was prepared under an ESEA Title III contract. (JP)

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BASIC MATH I

PACKAGE 01-06

ADDITION AND SUBTRACTION OF THE NUMBERS OF ARITHMETIC

Prepared by

Russ Thompson and Albert Fuller

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SE 017 558

Addition and Subtraction of The Numbers of Arithmetic

You are now ready to learn how to add and subtract the numbers of arithmetic. Remember, the numbers of arithmetic include fractions.

Fractions are used by most people nearly every day. Nearly all measurements turn out to be fractions. Consider some common measuring devices:

The measuring cup is marked in thirds, fourths, and halves. The inch is divided into halves, quarters, eights, and sixteenths. The pound is divided into halves, quarters, eights, and sixteenths. In fact, one of the characteristics of our present system of measurement is that it requires an understanding of how to work with fractions in order to do any computations involving measurements.

An important part of those computations includes addition and subtraction of fractions. It is difficult to find out exactly how well you have done on an assignment when fractional credit is allowed for answers that are partially right unless you know how to add fractions.

For instance, suppose that on a ten-question test you had five correct answers, one counted half right, one counted one-third right, and three counted one-fourth right. What was your total score on the test? You must add five, one-half, one-third, and three-fourths to find the answer. After you have studied this package you should ba able to work problems like this.

The Goal of package 01-06:

Is for you to increase your understanding of the numbers of arithmetic so that you will be more accurate in adding and subtracting them, and better able to solve applied problems involving them.

PACKAGE OBJECTIVES:

1. Given two or more fractional numerals, add them, and solve related applied problems.
2. Given two or more fractional numerals, add them by use of the least common denominator, and solve related applied problems.
3. Given two fractional numerals, subtract them, and solve related applied problems.
4. Given two fractional numerals identify the larger.
5. Given two mixed numerals, add them and solve related applied problems.
6. Given a subtraction problem involving at least one mixed numeral, find the difference, and solve related applied problems.
7. Given an applied problem which leads to multiplication or division with mixed numerals, solve it.

I. U. #01-06-01

Adding of Arithmetic Numbers

You will need to recall:

That fractional numerals can be renamed in many ways, using different denominators. If we multiply a fractional numeral by one or by a fractional numeral equivalent to one, the product is the same number that we started with. For example, we might multiply $\frac{3}{4}$ by a numeral which names one like $\frac{4}{4}$. $\frac{3}{4} \cdot \frac{4}{4} = \frac{12}{16}$. $\frac{12}{16}$ names the same number as $\frac{3}{4}$. $\frac{12}{16} = \frac{3}{4}$.

OBJECTIVES:

1. Given two fractional numerals with like denominators, add them.
2. Given two fractional numerals with different denominators, add them.
3. Given two or more fractional numerals, add them and solve related applied problems.

ACTIVITIES:

1. Study page 177, AAMA, "Like Denominators" and do margin exercises 1 - 8. (Objective 1)
2. Study "Different Denominators" pages 177 - 180, and do margin exercises 9 - 16. (Objective 2)
3. Write odd numbered exercises pages 191, 192. (Objectives 1, 2, 3)

Criterion Test 01-06-01-01

1. Add:

   (a) $\frac{5}{8} + \frac{3}{8}$ (b) $\frac{6}{12} + \frac{3}{12}$

2. Add:

   (a) $\frac{4}{5} + \frac{2}{3}$ (b) $\frac{3}{4} + \frac{2}{3}$

3. Solve:

   Hugh Farr walked $\frac{7}{5}$ mile to a friends house, $\frac{3}{4}$ mile to school, and $\frac{9}{10}$ mile back home. How far did Hugh Farr walk?

Criterion Test 01-06-01-02

1. Add:

   (a) $\frac{2}{3} + \frac{5}{3}$ (b) $\frac{3}{4} + \frac{7}{4}$

2. Add:

   (a) $\frac{2}{3} + \frac{3}{5}$ (b) $\frac{7}{8} + \frac{1}{2}$

3. Solve:

   Etta Mothful bought $\frac{1}{4}$ pound of candy $\frac{1}{2}$ pound of peanuts and $\frac{2}{3}$ pound of pop corn. How many pounds did she buy altogether?

Criterion Test 01-06-01-03

1. Add:

   (a) $\frac{3}{9} + \frac{4}{9}$ (b) $\frac{5}{98} + \frac{37}{98}$

2. Add:

   (a) $\frac{5}{4} + \frac{6}{5}$ (b) $\frac{7}{6} + \frac{8}{7}$

3. Solve:

   Chuck Stake, a butcher, sold $\frac{3}{4}$ pound of meat to Mrs. Green, $\frac{1}{2}$ pound to Mrs. Brown, and $\frac{1}{8}$ pound to Mrs. Black. How much meat did he sell?

Answers to Criterion Tests

Test 01-06-01-01

1. (a) $\frac{8}{8}$ (b) $\frac{9}{12}$

2. (a) $\frac{22}{15}$ (b) $\frac{17}{12}$

3. Let n = How far Hugh walked

   Then $\frac{7}{5} + \frac{3}{4} + \frac{9}{10} = n$ $n = \frac{610}{200}$

   He walked $\frac{61}{20}$ miles.

Test 01-06-01-02

1. (a) $\frac{7}{3}$ (b) $\frac{10}{4}$ or $\frac{5}{2}$

2. (a) $\frac{19}{15}$ (b) $\frac{22}{16}$ or $\frac{11}{8}$

3. Let n = The number of pounds Etta bought.

   Then $\frac{1}{4} + \frac{1}{2} + \frac{2}{3} = n$ $n = \frac{34}{24}$ or $\frac{17}{12}$

   Etta bought $\frac{17}{12}$ pounds.

Answers to Criterion Tests (Cont.)

Test 01-06-01-03

1. (a) $\frac{7}{9}$ (b) $\frac{42}{98}$ or $\frac{21}{49}$

2. (a) $\frac{49}{20}$ (b) $\frac{97}{42}$

3. Let n = Number of pounds Chuck sold.

   Then $\frac{3}{4} + \frac{1}{2} + \frac{1}{8} = n$, $n = \frac{11}{8}$

   Chuck sold $\frac{11}{8}$ pounds of meat.

I. U. #01-06-02

Addition by Finding Least Common Denominator

You will need to recall:

1. how to find the least common multiple of a pair of numbers. The least common denominator of a pair of fractions is the least common multiple of the denominators of those fractions.

2. The commutative and associative laws of addition and the distributive law of multiplication over addition. They apply to the numbers of arithmetic (fractions) just as they did to natural numbers.

OBJECTIVES:

1. Given two or more fractional numerals, add them by use of the least common denominator, and solve related applied problems.

ACTIVITIES:

1. Study pages 179 - 181, and do margin exercises 17 - 46. (Objective 1)

2. Do the odd exercises on pages 193, 194. (Objective 1)

Criterion Test 01-06-02-01

1. (A) Add, finding the least common denominator. Write the simplest numeral for your result.

(a) $\frac{5}{6} + \frac{2}{9}$ (b) $\frac{3}{2} + \frac{5}{4}$ (c) $\frac{1}{6} + \frac{11}{12}$

(B) A board $\frac{3}{8}$ inch thick is glued to a board $\frac{7}{16}$ inch thick and the glue is $\frac{1}{32}$ inch thick. How thick is the whole thing?

Criterion Test 01-06-02-02

1. (A) Add, finding the least common denominator. Write the simplest numeral for your result.

(a) $\frac{5}{7} + \frac{3}{14}$ (b) $\frac{17}{15} + \frac{13}{25}$ (c) $\frac{1}{2} + \frac{3}{8}$

(B) Solve: Willie Jogger works out every evening by jogging. On Mondays he jogs to the store and back, $\frac{1}{4}$ mile; on Tuesdays to the ball park and back, $\frac{1}{2}$ mile; on Wednesdays to church and back $\frac{2}{3}$ mile; and on Fridays he jogs home from work $\frac{3}{4}$ mile. How far does he jog in those four days?

Criterion Test 01-06-02-03

1. (A) Add, finding the least common denominator. Write the simplest numeral for your result.

(a) $\frac{15}{24} + \frac{7}{12}$ (b) $\frac{3}{8} + \frac{5}{12}$ (c) $\frac{1}{2} + \frac{1}{4}$

(B) Solve: Robert Walker took a walk. He went $\frac{3}{4}$ of a mile due east, $\frac{1}{15}$ of a mile due south and $\frac{3}{8}$ of a mile west. How far did he walk?

Answers to Criterion Tests

Test 01-06-02-01

1. (A) (a) $\frac{19}{18}$ (b) $\frac{11}{4}$ (c) $\frac{13}{12}$

(B) Let n = The thickness of the whole thing.

Then $n = \frac{3}{8} + \frac{7}{16} + \frac{1}{32}$ $n = \frac{27}{32}$

The whole thing is $\frac{27}{32}$ inch thick.

Test 01-06-02-02

1. (A) (a) $\frac{13}{14}$ (b) $\frac{124}{75}$ (c) $\frac{7}{8}$

(B) Let n = How far Willie jogs

Then $n = \frac{1}{4} + \frac{1}{2} + \frac{2}{3} + \frac{3}{4}$ $n = \frac{26}{12}$

Willie jogged $\frac{26}{12}$ miles.

Test 01-06-02-03

1. (A) (a) $\frac{29}{24}$ (b) $\frac{19}{24}$ (c) $\frac{3}{4}$

(B) Let n = How far Robert Walker walked.

Then $n = \frac{3}{4} + \frac{1}{16} + \frac{3}{8}$ $n = \frac{19}{16}$

Robert walked $\frac{19}{16}$ miles.

I. U. #01-06-03

Subtraction

You will need to recall:

How to find the least common denominator of two fractional numbers.

OBJECTIVES:

1. Given two fractional numerals, subtract them, and solve related applied problems.

ACTIVITIES:

1. Study page 182, AAMA, and do the margin exercises 47 - 55. (Objective 1)

2. Do odd exercises 1 - 19 page 195. (Objective 1)

3. Do odd applied problems 33 - 39. (Objective 1)

Criterion Test 01-06-03-01

1. Subtract:

(A) (a) $\frac{5}{8} - \frac{3}{8}$ (b) $\frac{5}{8} - \frac{1}{4}$ (c) $\frac{5}{8} - \frac{1}{2}$

(B) Solve: A business was owned by three men. One owned $\frac{5}{12}$ another owned $\frac{9}{24}$, What part was owned by the third man?

Criterion Test 01-06-03-02

1. Subtract:

(A) (a) $\frac{7}{9} - \frac{4}{9}$ (b) $\frac{7}{9} - \frac{5}{8}$ (c) $\frac{7}{9} - \frac{5}{18}$

(B) Solve: Joe ate $\frac{1}{3}$ of a pie and john ate $\frac{1}{6}$ of it. What part is left?

Criterion Test 01-06-03-03

1. Subtract:

(A) (a) $\frac{4}{5} - \frac{2}{5}$ (b) $\frac{4}{5} - \frac{2}{3}$ (c) $\frac{4}{5} - \frac{1}{15}$

(B) Solve: A man can dig a hole in $\frac{3}{4}$ hour. A back hoe can dig the same hole in $\frac{1}{8}$ hour. How much longer does it take the man?

Answers to Criterion Tests

Test 01-06-03-01

1. (A) (a) $\frac{2}{8}$ or $\frac{1}{4}$ (b) $\frac{3}{8}$ (c) $\frac{4}{8}$

(B) $\frac{5}{24}$ part of the business

Test 01-06-03-02

1. (A) (a) $\frac{3}{9}$ or $\frac{1}{3}$ (b) $\frac{11}{72}$ (c) $\frac{1}{2}$

(B) $\frac{1}{2}$ of the pie

Test 01-06-03-03

1. (A) (a) $\frac{2}{5}$ (b) $\frac{2}{15}$ (c) $\frac{11}{15}$

(B) $\frac{5}{8}$ hours

I. U. #01-06-04

Order

OBJECTIVES:

1. Given two numbers of arithmetic identify the larger.

ACTIVITIES:

1. Study pages 183, 184 and do margin exercises 56 - 67. (Objective 1)

2. Write the odd exercises 21 - 31 on pages 195 - 196. (Objective 1)

Criterion Test 01-06-04-01

1. Identify the larger numeral by proper use of the symbols < or > .

   (a) $\frac{6}{9}$ or $\frac{7}{11}$ (b) $\frac{12}{7}$ or $\frac{15}{11}$ (c) $\frac{5}{9}$ or $\frac{7}{10}$

Criterion Test 01-06-04-02

1. Identify the larger numeral by proper use of the symbols < or >.

   (a) $\frac{21}{5}$ or $\frac{27}{7}$ (b) $\frac{31}{21}$ or $\frac{41}{13}$ (c) $\frac{85}{19}$ or $\frac{102}{23}$

Criterion Test 01-06-04-03

1. Identify the larger numeral by proper use of the symbols < or >.

   (a) $\frac{12}{7}$ or $\frac{132}{49}$ (b) $\frac{9}{5}$ or $\frac{11}{7}$ (c) $\frac{47}{83}$ or $\frac{31}{13}$

Answers to Criterion Tests

Test 01-06-04-01

1. (a) $\frac{6}{9} > \frac{7}{11}$ (b) $\frac{12}{7} > \frac{15}{11}$ (c) $\frac{5}{9} < \frac{7}{10}$

Test 01-06-04-02

1. (a) $\frac{21}{5} > \frac{27}{7}$ (b) $\frac{31}{21} < \frac{41}{13}$ (c) $\frac{85}{19} > \frac{102}{23}$

Test 01-06-04-03

1. (a) $\frac{12}{7} < \frac{132}{49}$ (b) $\frac{9}{5} > \frac{11}{7}$ (c) $\frac{47}{83} < \frac{31}{13}$

I. U. #01-06-05

Addition of
Mixed Numerals

You will need to recall:

How to add fractional numerals.

OBJECTIVES:

1. Given a mixed numeral convert it to a fractional numeral.

2. Given a fractional numeral which names a number larger than 1, convert it to a mixed numeral.

3. Given two mixed numerals, add them, and solve related applied problems.

ACTIVITIES:

1. Study pages 185 - 187 and do margin exercises 68 - 87. (Objectives 1, 2, 3)

2. Write odd numbered exercises 1 - 41, pages 197, 198. (Objectives 1, 2, 3)

Criterion Test 01-06-05-01

1. Convert to a fractional numeral.

   (a) $4\frac{2}{3}$ (b) $9\frac{2}{7}$

2. Convert to a mixed numeral.

   (a) $\frac{25}{3}$ (b) $\frac{15}{6}$

3. Add.

   (a) $2\frac{3}{4} + 1\frac{2}{3}$ (b) $14\frac{1}{2} + 3\frac{5}{16}$

4. Solve.

   The mass of three batches of a certain chemical were $42\frac{3}{4}$ grams, $68\frac{1}{4}$ grams and $97\frac{1}{2}$ grams. What was the total mass of the three batches of chemical?

Criterion Test 01-06-05-02

1. Convert to a fractional numeral.

   (a) $5\frac{7}{8}$ (b) $17\frac{2}{3}$

2. Convert to a mixed numeral.

   (a) $\frac{45}{2}$ (b) $\frac{32}{7}$

3. Add.

   (a) $4\frac{5}{9} + 2\frac{1}{7}$ (b) $3\frac{1}{2} + 2\frac{1}{9}$

4. Solve.

   Kate weighs $68\frac{1}{4}$ pounds. John weighs $3\frac{1}{2}$ pounds more. How much does John weigh?

Criterion Test 01-06-05-03

1. Convert to a fractional numeral.

   (a) $3\frac{1}{2}$ (b) $75\frac{2}{5}$

2. Convert to a mixed numeral.

   (a) $\frac{39}{14}$ (b) $\frac{13}{6}$

3. Add.

   (a) $5\frac{3}{7} + 1\frac{1}{6}$ (b) $1\frac{5}{16} + 2\frac{1}{2}$

4. Solve.

   A sailboat can go 7 miles with the wind in $1\frac{1}{4}$ hours. It can return against the wind in $2\frac{3}{8}$ hours. How long will it take to travel the 7 miles with the wind and return?

Answers to Criterion Tests

Test 01-06-05-01

1. (a) $\frac{14}{3}$ (b) $\frac{65}{7}$

2. (a) $8\frac{1}{3}$ (b) $2\frac{1}{2}$

3. (a) $4\frac{5}{12}$ (b) $17\frac{13}{16}$

4. $208\frac{1}{2}$ grams

Test 01-06-05-02

1. (a) $\frac{87}{8}$ (b) $\frac{53}{3}$

2. (a) $27\frac{1}{2}$ (b) $4\frac{4}{7}$

3. (a) $6\frac{44}{63}$ (b) $5\frac{11}{18}$

4. $71\frac{3}{4}$ pounds

Answers to Criterion Test (Cont.)

Test 01-06-05-03

1. (a) $\frac{7}{2}$ (b) $\frac{377}{5}$

2. (a) $2\frac{11}{14}$ (b) $2\frac{1}{6}$

3. (a) $6\frac{25}{42}$ (b) $3\frac{13}{16}$

4. $3\frac{5}{8}$ hours

I. U. # 01-06-06

Subtraction of Mixed Numerals

You will need to recall:

How to subtract fractional numerals.

OBJECTIVES:

1. Given a subtraction problem involving at least one mixed number, find the difference and solve related applied problems.

ACTIVITIES:

1. Study "Subtraction" pages 187, 188 and do margin exercises 88 - 91. (Objective 1)

2. Do odd numbered exercises 43 - 49 on pages 198, 199. (Objective 1)

Criterion Test 01-06-06-01

1. Subtract.

(a) $2\frac{3}{4} - 1\frac{2}{3}$ (b) $14\frac{1}{2} - 3\frac{9}{16}$

(c) $3 - 1\frac{5}{6}$ (d) $4\frac{3}{8} - 3$

Solve.

(e) A $6\frac{3}{8}$ foot post is set $2\frac{1}{2}$ feet in the ground. How much is above the ground?

Criterion Test 01-06-06-02

1. Subtract.

(a) $5\frac{3}{8} - 2\frac{1}{7}$ (b) $3\frac{1}{2} - 1\frac{4}{7}$

(c) $10 - 5\frac{2}{3}$ (d) $5\frac{2}{3} - 3$

Solve.

(e) The average rainfall for June 1st is $8\frac{3}{4}$ inches. if it has rained $10\frac{1}{16}$ inches on June 1st, how much more rain than average have we received?

Criterion Test 01-06-06-03

1. Subtract.

(a) $5\frac{3}{7} - 1\frac{1}{4}$ (b) $7\frac{5}{16} - 2\frac{1}{2}$

(c) $13 - 5\frac{2}{3}$ (d) $14\frac{5}{8} - 7$

Solve.

(e) A calf weighed $425\frac{3}{4}$ pounds when it was bought and $1050\frac{1}{2}$ pounds when it was sold. How much did it gain?

Answers to Criterion Tests

Test 01-06-06-01

1. (a) $1\frac{1}{12}$ (b) $10\frac{15}{16}$ (c) $1\frac{1}{6}$ (d) $1\frac{3}{8}$

(e) $3\frac{7}{8}$ feet

Test 01-06-06-02

1. (a) $3\frac{13}{56}$ (b) $1\frac{13}{14}$ (c) $4\frac{1}{3}$ (d) $2\frac{2}{3}$

(e) $1\frac{5}{16}$ inches

Test 01-06-06-03

1. (a) $4\frac{5}{28}$ (b) $4\frac{13}{16}$ (c) $7\frac{1}{3}$ (d) $7\frac{5}{8}$

(e) $624\frac{3}{4}$ pounds

I. U. # 01-06-07

Multiplication and Division With Mixed Numerals

01-06

You will need to recall:

How to multiply and divide with fractional numerals.

OBJECTIVES:

1. Given a multiplication problem involving at least one mixed numeral, find the product.

2. Given a division problem involving at least one mixed numeral, find the quotient.

3. Given an applied problem which leads to multiplication or division with mixed numerals, solve it.

ACTIVITIES:

1. Study "Multiplication" and "Division" on pages 188, 189. (Objectives 1, 2)

2. Work odd numbered exercises 51 - 73. Pages 199, 200. (Objectives 1, 2)

3. Work odd numbered applied problems 79 -109. Some of these apply to objective 3 of this Instructional Unit, some of them apply to Instructional Units 1 - 6, but all of them will help you meet part of the goal of this package, "to be better able to solve applied problems."

Criterion Test 01-06-07-01

1. Find the product.

   (a) $5\frac{7}{8} \cdot 2\frac{2}{5}$ (b) $8\frac{2}{3} \cdot 3\frac{1}{8}$

2. Find the quotient.

   (a) $5\frac{1}{10} \div 4\frac{3}{10}$ (b) $7\frac{1}{2} \div \frac{5}{6}$

3. Solve.

   (a) A covered wagon averaged $1\frac{3}{8}$ miles per hour for $14\frac{3}{4}$ hours. How far did it go?

   (b) Water weighs $62\frac{1}{2}$ pounds per cubic foot. How much water would it take to weigh a ton? (A ton is 2000 pounds)

Criterion Test 01-06-07-02

1. Find the product.

   (a) $9\frac{1}{2} \cdot 5\frac{1}{5}$ (b) $2\frac{1}{4} \cdot 3\frac{2}{3}$

2. Find the quotient.

   (a) $2\frac{1}{10} \div 4\frac{1}{5}$ (b) $1\frac{5}{12} \div 8\frac{1}{2}$

3. Solve.

   (a) Water weighs $62\frac{1}{2}$ pounds per cubic foot. How many pounds will $14\frac{1}{4}$ cubic feet of water weigh?

   (b) If a car averages $55\frac{1}{2}$ M.P.H. and goes $222\frac{1}{2}$ miles, how many hours does it take?

Criterion Test 01-06-07 03

1. Find the product.

   (a) $4\frac{1}{2} \cdot 3\frac{2}{7}$ (b) $3\frac{1}{4} \cdot 7\frac{2}{3}$

2. Find the quotient.

   (a) $12\frac{2}{3} \div 3\frac{1}{3}$ (b) $1\frac{4}{5} \div \frac{3}{5}$

3. Solve.

   (a) If a record makes $33\frac{1}{3}$ revolutions per minute, how long will it take to make 5280 revolutions?

   (b) If a record makes $33\frac{1}{3}$ revolutions per minute, how many revolutions will it make in an hour?

Answers to Criterion Tests

Test 01-06-07-01

1. (a) $14\frac{1}{10}$ (b) $27\frac{1}{12}$

2. (a) $1\frac{8}{43}$ (b) 9

3. (a) $20\frac{9}{32}$ miles (b) 32 cubic feet

Test 01-06-07-02

1. (a) $49\frac{2}{5}$ (b) $8\frac{1}{4}$

2. (a) $\frac{1}{2}$ (b) $\frac{1}{6}$

3. (a) $890\frac{5}{8}$ pounds (b) $4\frac{1}{111}$ hours

Test 01-06-07-03

1. (a) $14\frac{11}{14}$ (b) $24\frac{11}{12}$

2. (a) $3\frac{4}{5}$ (b) 3

3. (a) $158\frac{2}{5}$ minutes (b) 2000 revolutions

THE END
Package 01-06